

Louis Jurine: Chirurgien et Naturaliste

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There is a sad little joke about nobody being able to name five famous Belgians. The same could almost be said of the Swiss—not many historical figures between William Tell and Karl Jung. However, a new biography of Louis Jurine (1751–1819) describes a scientist whose life and reputation certainly deserve reappraisal. Beautifully produced and illustrated, the book is a model of careful scholarship.

Jurine spent almost all his life in Geneva. His parents were humble folk from Lyon, which meant that, although classed as a 'native', he did not have full civic rights. He was a gifted child, and having finished school was admitted in 1767 to the Académie des Beaux Arts, where he spent two years, intending to take up a literary career. His parents however had different ideas and apprenticed him to a surgeon, and in 1773 he was accepted as a *maître en chirurgie*, an imposing title that carried little in the way of prestige, as surgeons were tradesmen rather than true professionals like physicians. Good fortune then came Louis' way, as he married into the family of Pierre Bonnet, a prominent local citizen. Mlle Bonnet brought with her a large dowry which enabled the young couple to travel to Paris, where he studied for two years and came back with the degree of Docteur en Chirurgie, which greatly increased his professional status.

There was at that time a shortage of surgeons in Geneva, so that in spite of his not being a citizen he was appointed as one of the three chiefs at the General Hospital, and was able to open his own barber-surgeons shop in the Rue de la Poissonnerie. The shop did well and Jurine was able to delegate much of the work, and to pursue his developing interest in natural history. His reputation in the surrounding district grew and he was frequently called in for difficult private cases as far away as Basel or Berne. Among his famous patients were Madame de Staël and members of the Napoleonic Royal Family. Given the primitive state of surgery at that time, with no antisepsis or anaesthetics, involving gruesome and painful procedures which even in the best hands frequently ended in mutilation or death, it is understandable that a kindly disposed young man should have turned to the world of nature. At first he spent the day in surgery and the evenings and nights in the accumulation of his collection of plants, birds, insects and minerals from the area around the Lake of Geneva, but finally, having accumulated a considerable fortune, he was able to abandon surgery altogether. His status as a naturalist was greatly enhanced by the award of two gold medals from Paris, one

on 'eudiometry' (the study of natural gases) and the other on artificial milk.

The normally staid and placid town of Geneva was shaken by events in Paris during the Revolution of 1789, and the city was briefly annexed by France. Politics became polarized, and Jurine seems to have been inclined to the revolutionary cause, and was expected, as a prominent citizen, to take part in local committees and councils. However, his nature was unsuited to political struggle, and he refused most of the positions offered him, apart from membership of the National Assembly. In 1793 he was awarded 800 Louis to establish and equip a school of anatomy, but managed to divert the sum to charitable causes.

His reputation as a naturalist rapidly grew. Over the next ten years he produced a definitive study of insect wings, beautifully illustrated by his daughter Christine. This was followed by a monograph on the comparative anatomy of water fleas, of which he discovered several new species. He produced a complete classification of the minerals found in the Alps around Geneva, and classified and illustrated every variety of fish. A devout Christian, he saw the immensity of natural variety as firm evidence of a guiding spirit (*ubi materia—ibi mens!*). His immense collection of specimens was visited by many noblemen as part of the grand tour. Inevitably, he came into conflict with the other famous naturalists of the day, including the redoubtable Baron Cuvier. Jurine and Cuvier had a common interest in the navigational abilities of bats. How could this tiny creature catch flies from the air in a dark room, never touching a single object? Some authorities held that the bat had exceptionally acute sight, others that the ability was a function of hearing, and there was a body of opinion which claimed that the bat had a 'sixth sense' not shared by any other species. In attempts to resolve this mystery Cuvier blinded a number of bats while Jurine stopped their ears with wax. Each accused the other of unwarranted cruelty, though Jurine conceded that a degree of cruelty was justified if it advanced knowledge. He drew the line at Baron Cuvier's removing the larynx from a living goose in order to investigate its respiration. In fact, remarkably enough, the bat's secret was not revealed for another 150 years following the discovery of radar when it was realized that the creature had been using echolocation for several million years.

Jurine kept his interest in mineralogy and, in particular, in the origin of mountains. The prevailing view at the time was that irregularities of the earth's surface had been produced by varying degrees of precipitation from the sea, which had at one time covered the entire planet but had since receded. From his studies of Mont Blanc and surrounding alpine chains, Jurine and his associates demonstrated that, so far from lying in horizontal layers, the different rocks and minerals were arranged in a vertical

fashion, which could only have been the result of events beneath the earth's surface, such as volcanoes and tectonic slips. They postulated a huge subterranean 'oven' fuelled by an unknown gas.

Eventually, Jurine began to record pains in his chest, extending up into his neck and down his left arm, accentuated by effort or exercise. It was one of the first subjective descriptions of myocardial ischaemia, from which he perished peacefully in the town of his birth, on 17 September 1819. The convulsions of the Napoleonic Wars had entirely passed him by. There is something to be said for living in Geneva.

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Intraoperative Irradiation: Techniques and Results

Editors: Leonard Gunderson, Christopher Willet, Louis Harrison, Felipe Calvo

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For common solid tumours, it is often impossible for a surgeon to remove the mass lesion with clear operative margins. Conventional external beam radiotherapy can be given to improve local tumour control, either before or after the surgery. The greater the effective dose of radiotherapy given the greater the improvement in the rate of local tumour control. This was illustrated by the Swedish Rectal Trial, in which combined preoperative external beam radiotherapy and surgery was compared with surgery alone (*N Engl J Med* 1997; **336**: 980). The irradiation did not increase postoperative mortality; and after five years of follow-up the rate of local recurrence was 11% in the group that received radiotherapy before surgery and 27% in the group treated with surgery alone ($P < 0.001$). But external beam radiotherapy is limited in its effective dose by normal-tissue damage. The beam reaches the site of the tumour by passing through the uninvolved 'critical tissues' of the body to reach the 'tumour target volume', the intended site of treatment. The higher the effective dose to these tissues and the greater their volume, the greater is the risk of normal-tissue fibrosis and necrosis. Systems such as 'conformal radiotherapy' may reduce these risks by use of beam-shaping devices and three-dimensional physics planning computers to conform the high dose areas of the radiation beams over the tumour target volume while minimizing dose to the surrounding normal tissues. In prostate cancer, patients receiving conformal radiotherapy had a substantially lower rate of proctitis after treatment than those randomized to conventional treatment with the same dose, though tumour

control and survival did not differ (*Lancet* 1999; **353**: 267). Conformal radiotherapy is being used in the Medical Research Council RTO1 trial to test the safety and effectiveness of a 15.6% increase in radiation dose for early prostate cancer. In *Intraoperative Irradiation*, Leonard Gunderson and others review the intraoperative techniques which may deliver substantially greater effective doses of radiotherapy to the tumour target volume, with correspondingly greater potential for improving local tumour control. Intraoperative external beam radiotherapy permits large increases in the dose by physical removal of critical normal tissues out of the path of the high dose radiation. At operation, these normal tissues are moved aside, and a beam of radiotherapy is directed at the site of tumour. In the past, the anaesthetized patient had to be taken to the radiotherapy department for treatment—a major disincentive to developing this treatment unless a hospital was prepared to fund a dedicated radiotherapy-equipped operating theatre. Now mobile radiotherapy machines such as the Mobetron or Novac-7 can be taken into conventional operating theatres. An example of this strategy is the Mayo Clinic programme for locally advanced rectal carcinoma (*Int J Radiat Biol Phys* 1997; **37**: 601).

Another method is brachytherapy, for which high-dose-rate machines are becoming available in most radiotherapy departments. They are portable units which use small radioactive metal sources in the form of metal beads that can be delivered by remote control to sites 2 metres away through flexible fine-bore cannulae. The rapid fall-off in radiation dose with distance from the source means that the surgeon must position the cannulae at the site of the tumour. This limits the dose to surrounding critical normal tissues, which can be protected further by shielding behind sterile lead sheets or discs. Treatment times may be as short as a few minutes, and structures as small as the lumen of a coronary artery may be treated. Multiple cannulae may be placed in parallel to treat large targets such as pelvic side walls involved by bowel cancer, as used at the Memorial Sloan Kettering Cancer Center for primary unresectable or locally recurrent rectal cancer (*Int J Radiat Biol Phys* 1998; **42**: 325). The technical advances in the specialized radiotherapy machines now permit most cancer centres to consider an intraoperative radiotherapy programme.

This excellent and well referenced book would serve as an introduction and stimulus to many cancer treatment teams. It includes chapters on the physical and radiobiological science, descriptions of the techniques and machines, the requirements for treatment facilities, normal tissue toxicity, treatment outcomes by disease sites, and discussion of future possibilities.

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